

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

THE BIONOMICS, IMMATURE STAGES, AND
DISTRIBUTION OF THE RARE PREDACIOUS
WATER BEETLE, *HOPERIUS PLANATUS*
(COLEOPTERA: DYTISCIDAE)

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The genus *Hoperius* was described by Fall (1927) for the species *H. planatus* from Hope, Arkansas. The species is rare in collections and it was an enigma to me until January 1968 when I identified three specimens as *H. planatus* from a shipment of water beetles received for determination from Dr. Vernon M. Kirk. A short time later, I identified two additional specimens of *H. planatus* that were collected by Mr. John L. Hellman at a blacklight operated near a woodland pond at Easton, Talbot County, Maryland. The occurrence of *H. planatus* nearby in Maryland prompted the investigation of its immature stages and resulted in this report.

I am grateful to the following individuals for the loan of their specimens or specimens in their care; the acronyms following the names will identify the source of the material listed under specimens examined: Dr. Robert D. Gordon (RDG); Dr. Vernon M. Kirk (VMK); Mr. Warren Steiner (WS); Ms. Janice White, Museum of Comparative Zoology, Harvard University (MCZ). I also thank Dr. James Matta, Mr. John L. Hellman, and Ms. Joyce Utmar for donating specimens of *H. planatus* to the National Museum of Natural History, Smithsonian Institution (USNM).

I also tender my thanks to Mr. Michael Druckenbrod, Smithsonian Institution staff artist, for the illustrations of the adult, larva, and pupa of *planatus* included in this study.

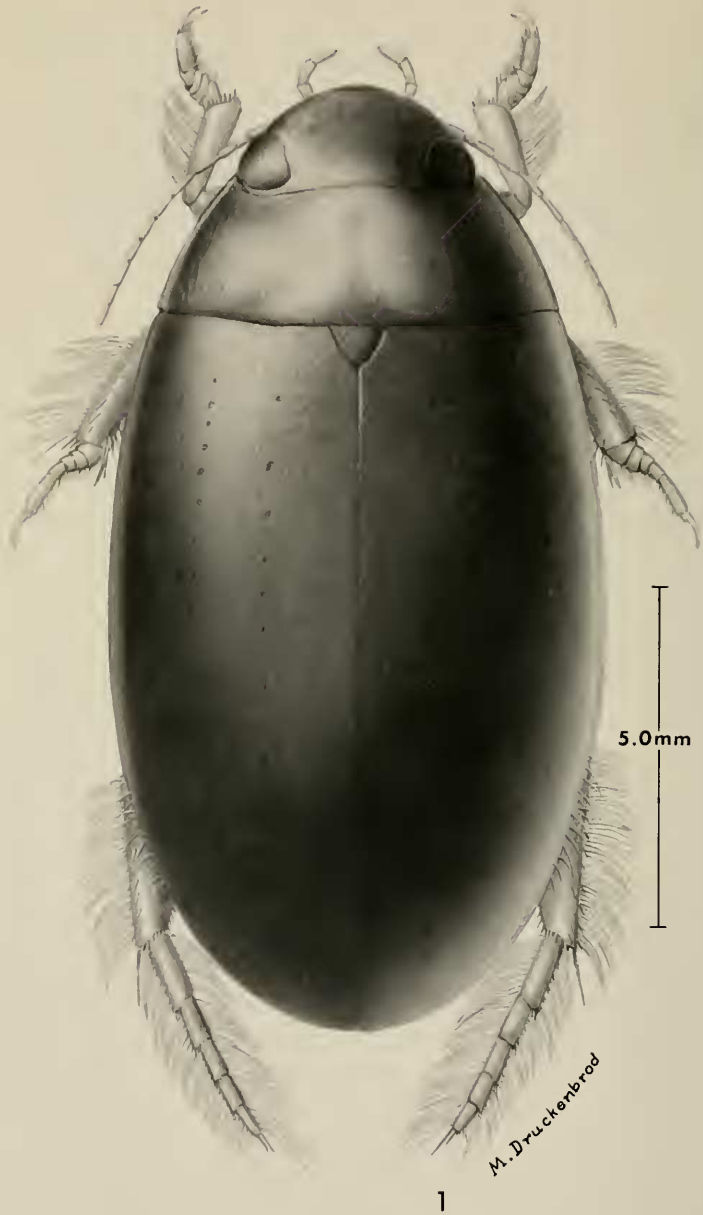


FIG. 1. *Hoperius planatus* Fall, adult ♂, habitus.

Genus *Hoperius* Fall

Hoperius Fall, 1927:177; type-species, *Hoperius planatus*, by monotypy.—Leech, 1956:312.—Spangler, 1972:429.

Hoperius planatus Fall

Figures 1–6, 12

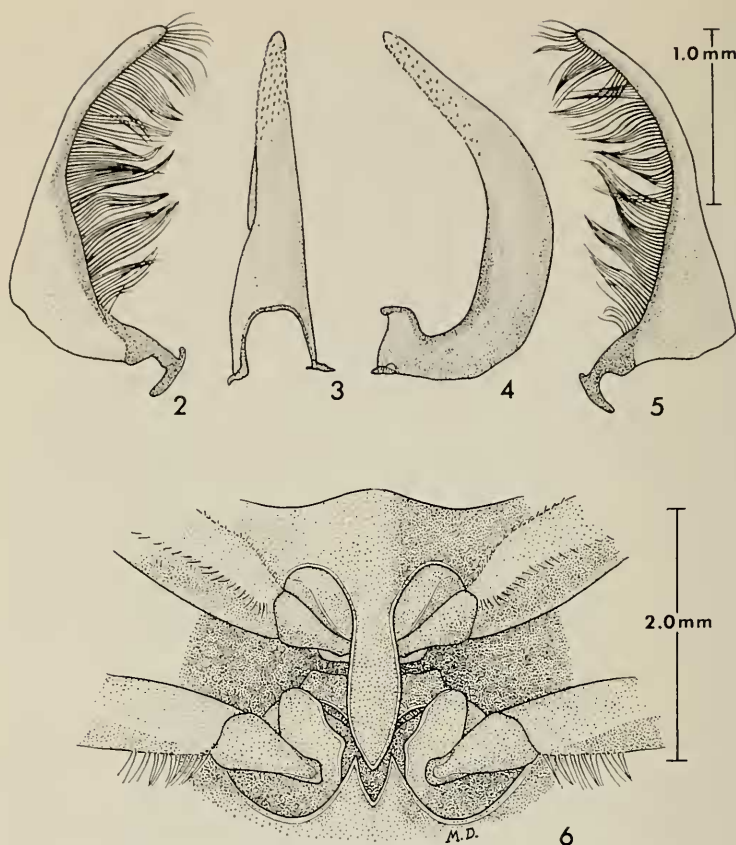
Hoperius planatus Fall, 1927:179; type-locality: Hope, Hempstead County, Arkansas; type, ♂, in the Museum of Comparative Zoology, Harvard University, examined.—Blackwelder, 1939:17.—Kirk, 1969:20.

The male type-specimen was described adequately by Fall. The female of *H. planatus* is similar to but differs from the male (Figs. 1–6) as follows. Females average slightly longer (13 mm–14 mm) than males (12 mm–13 mm); pro- and mesotarsus of female not broadened, lacking sucker bearing setae; inner (lower) surface of hind tibia and outer (upper) surface of hind tarsus of female lack the long golden natatory setae that are present on inner as well as outer surfaces of both tibia and tarsus of male.

BIONOMICS

The discovery of *planatus* near the woodland pond suggested that it was a woodland-pond inhabitant and led to five subsequent collecting trips to the pond to search for the beetle and its larva. The first of these visits to the pond was unfruitful but on each of the four subsequent visits a few adults or adults and larvae were collected.

The pond in which the adults and larvae of *Hoperius* were found is located within a beech-maple forest at Easton, Maryland. The main pond is bordered with a stand of *Cephalanthus occidentalis* L. Adults of *Hoperius* were found first in a small (approximately 15 feet by 10 feet and 1½ feet deep) pool that was isolated from the main pond because of a midsummer drought. This isolated pool lacked aquatic plants and the bottom was covered with rotting leaves; the beetles were found by sorting through the leaves dipped from the shallow margins of the pool. Adults and larvae of *Hoperius* were collected later from among leaves dipped from the edges of the main pond.



FIGS. 2-6. *Hoperius planatus* Fall, adult ♂: Figs. 2-5, Aedeagus: 2, right paramere, lv; 3, median lobe, vv; 4, median lobe, lv; 5, left paramere, lv. Fig. 6. Prosternal process, vv. lv = lateral view; vv = ventral view.

In addition to *Hoperius planatus*, the following species of aquatic coleoptera were collected from the pond at Easton, Maryland. Dytiscidae: *Acilius fraternus* (Harris), *Acilius semisulcatus* Aubé, *Agabetes acuductus* (Harris), *Bidessonotus inconspicuus* (LeConte), *Coptotomus interrogatus* (Fab.), *Desmopachria grana* (LeConte), *Dytiscus hybridus* Aubé, *Graphoderus liberus* (Say), *Hydaticus bimarginatus* (Say), *Laccophilus fasciatus rufus* Melsheimer, *Laccophilus maculosus*

maculosus (Germar), *Matus bicarinatus* (Say), *Rhantus calidus* (Fab.), *Thermonectus basillaris* (Harris), *Uvarus granarius* (Aubé). Noteridae: *Hydrocanthus iricolor* Say, *Suphisellus puncticollis* Crotch. Hydrophilidae: *Enochrus ochraceus* (Melsheimer), *Enochrus perplexus* (LeConte), *Helocombus bifidus* (LeConte), *Hydrochara obtusata* (Say), *Tropisternus blatchleyi* d'Orchymont, *Tropisternus lateralis nimbatus* (Say), *Tropisternus collaris striolatus* (LeConte).

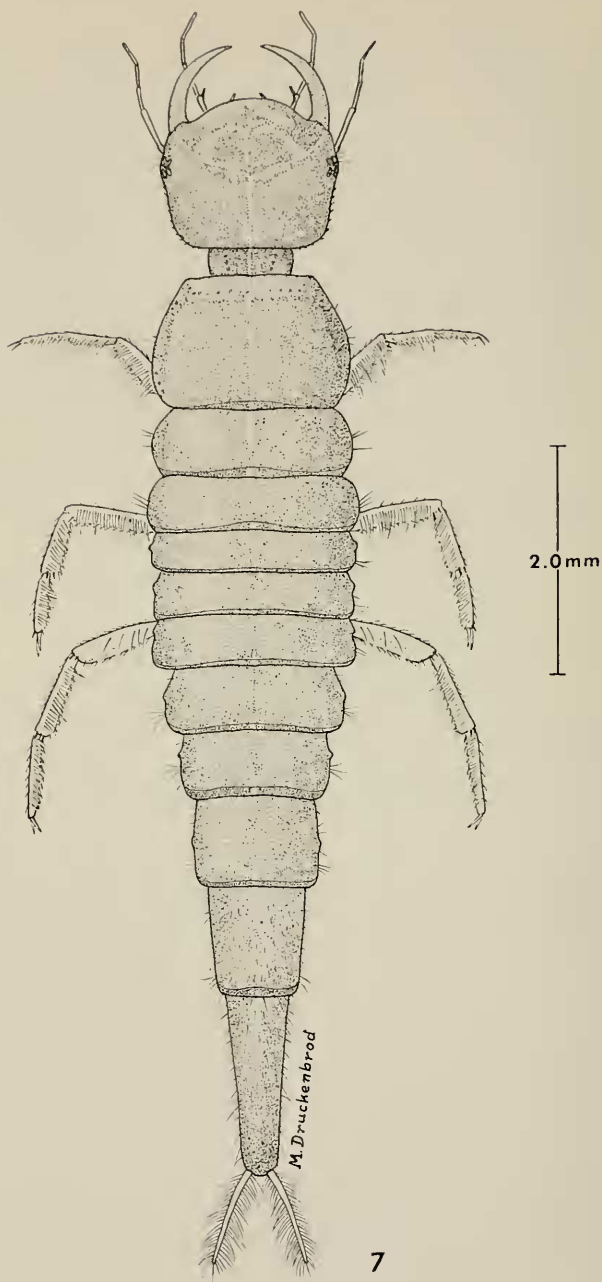
On 8 May 1972, Phyllis Spangler and I collected a larva from the pond at Easton that by elimination had to be *Hopperius planatus* or *Rhantus calidus* Fabricius. When the larva from Easton was compared casually with larvae of *R. calidus* the differences between the two were obvious and it was presumed to be the larva of *Hopperius*. To eliminate doubt as to the identity of the larva I tried to rear it but the larva died. Before I found that the larva had died, specimens of an ostracod ate their way into the body cavity and devoured most of the viscera. The specimen was preserved but was not described because the presumed identity of the larva was unconfirmed and the larva was partially destroyed.

On 6 May 1973, Phyllis Spangler and I returned to the Easton pond and obtained one adult and four last-instar larvae of *H. planatus* in 4 hours of collecting. The four larvae were kept alive for several days but would not eat food offered to them. The larvae were then transferred to small finger bowls containing damp leaves. Two of the larvae died and two pupated. One pupa was allowed to eclose after which the remaining pupa was photographed and then preserved for descriptive purposes. Table 1 shows the results of four

TABLE 1.—Rearing data for pupation of *Hopperius planatus*.

Larva No.	Date collected	Larva died	Date pupated	Date eclosed	pupation Days in	Date preserved
1	6 V 1973	12 V 1973	—	—	—	12 V 1973
2	6 V 1973	15 V 1973	—	—	—	—*
3	6 V 1973	—	2 V 1973	—	—	26 V 1973
4	6 V 1973	—	17 V 1973	26 V 1973	9	—

* Larva decayed and was not preserved.



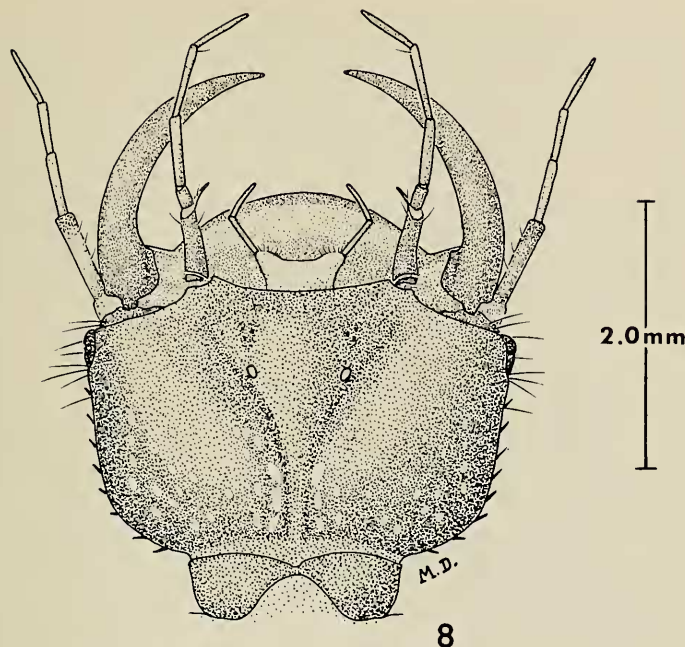


FIG. 8. *Hopperius planatus* Fall, larva, head, ventral view.

rearing attempts, and the larva and pupa of *planatus* are described below.

Description of the Third-Instar Larva of *Hopperius planatus*
Figures 7-8

Length, 18.5 mm; width of pronotum at base, 3.5 mm. Body depressed, elongate, almost parallel sided to 4th abdominal segment then tapering to apex of last abdominal segment. Color of integument infusate, with numerous cream-colored and a few darker maculae as illustrated (Fig. 7). Abdominal segments 1-6 each with a dark brown lateral band ventrolaterally of each spiracle; integument below bands creamy white. Unsclerotized areas of venter creamy white.

Head robust, broader than long, broadest across anterolateral angles (at ocelli). Labroclypeus with dense row of yellowish setae along anterior

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FIG. 7. *Hopperius planatus* Fall, larva, habitus.

margin; anterolateral angles prominent and extended in front of bases of antennae. Ecdysial cleavage line distinct at base of head, forked at midlength between ocular areas; frontal arms of ecdysial cleavage line diverge and extend to bases of mandibles anterior of antennal insertion. Ocular areas each with 6 large ocelli arranged in an ellipse, 3 ocelli in anterior row and 3 ocelli in posterior row; several long slender setae adjacent to ocelli. A horizontal row of 8 or 9 stout temporal setae behind each ocular area. Antenna tetramerous, cylindrical; basal segment longer than subsequent segments and bearing 3 short setae apicomediaally.

Mandible long, slender, falciform; incurved and sharp apically; hollow, with aperture on inner apical margin. Maxillary stipes elongate. Galea small, slender, elongate, bearing 1 small seta on lateral margin near base. Maxillary palpus 4 segmented; basal segment (palpifer) shortest and bearing 2 apical setae, 1 on lateral margin and 1 on medial margin; 2nd and 3rd segments subequal; 3rd segment bearing 1 small seta apicomediaally; ultimate segment about twice as long as basal segment. Labium broadly rectangular; anterior margin broadest, moderately emarginate and bearing 8 to 10 setae mediad of insertion of each labial palpus; labial palpus very slender, 2 segmented; ligula absent.

Pronotum broader than long; lateral margins strongly arcuate, moderately explanate, and bearing a few long slender setae; anterior margin truncate and bearing a few long slender setae; posterior margin feebly bisinuate. Mesonotum slightly broader than and less than half as long as pronotum and bearing a few long lateral setae and a spiracle in pleural region below each anterolateral angle of mesonotal sclerite. Metanotum slightly wider than and slightly shorter than mesonotum and bearing a few long lateral setae.

Legs moderately elongate; 5 segmented. Forelegs with coxa 3 times as long as trochanter and bearing several stout setae on ventromedial margin and on dorsomedial surface; trochanter short and bearing 3 to 5 short setae on dorsomedial surface; femur slightly shorter than tibia and tarsus combined, bearing numerous short setae and a row of natatory hairs on anterior (upper) surface and numerous long stout setae on posterior (ventral) surface; tibia about as long as tarsus, bearing several short stout setae and a row of natatory hairs on anterior surface and numerous long stout setae on posterior surface; tarsus with a few short setae and a row of natatory hairs on anterior surface and numerous long stout setae on posterior surface, terminating in 2 elongate moderately stout claws.

Abdomen of 8 distinct segments; segments 1 through 6 with dorsal sclerites; segments 7 and 8 completely sclerotized, ringlike. Terga of segments 1 through 8 with scattered setae over surface and along lateral and posterior margins. Segments 7 and 8 bearing numerous long, slender, lateral setae in addition to the short setae scattered over the surface. Segment 8 elongate, slightly more than twice length of 7th segment, terminating in 2 cerci that arise from beneath apex. Cerci elongate,

almost as long as 8th segment, bearing numerous long black setae primarily on lateral and medial margins. Lateral margins of segments 1 through 7 each with a spiracle. Mesopleura, metapleura, and pleural folds of abdominal segments 1 through 6 each with 1 or 2 long setae arising from the integument. Segments 1 through 6 also with 1 or 2 long, slender, dark setae arising from integument ventrally near posterior margins on each side of midline.

The larva of *Hoperius* runs to couplet 8 in Chandler's (1956) key to the larvae of the known Nearctic genera of Dytiscidae. By modifying Chandler's couplet 8, the larva of *Hoperius* may be distinguished from larvae of the other North American colymbetinae genera as follows.

- 8. Fourth (last) segment of antennae more than $\frac{2}{3}$ the length of 3rd segment 8A
- Fourth (last) segment of antennae less than $\frac{2}{3}$ the length of 3rd segment (Chandler's couplet number) 9
- 8A. Tarsal claws not spinulose in basal half on lower margin -- *Hoperius*
- Tarsal claws spinulose in basal half on lower margin 8B
- 8B. Last-instar larva no longer than 25 mm; occurs throughout North and South America *Rhantus**
- Last-instar larva longer than 27 mm; occurs primarily in the Boreal Region of North America following mountains south at least into Pennsylvania, Colorado, and southern California *Colymbetes*

Description of the Pupa of *Hoperius planatus*

Figures 8-11

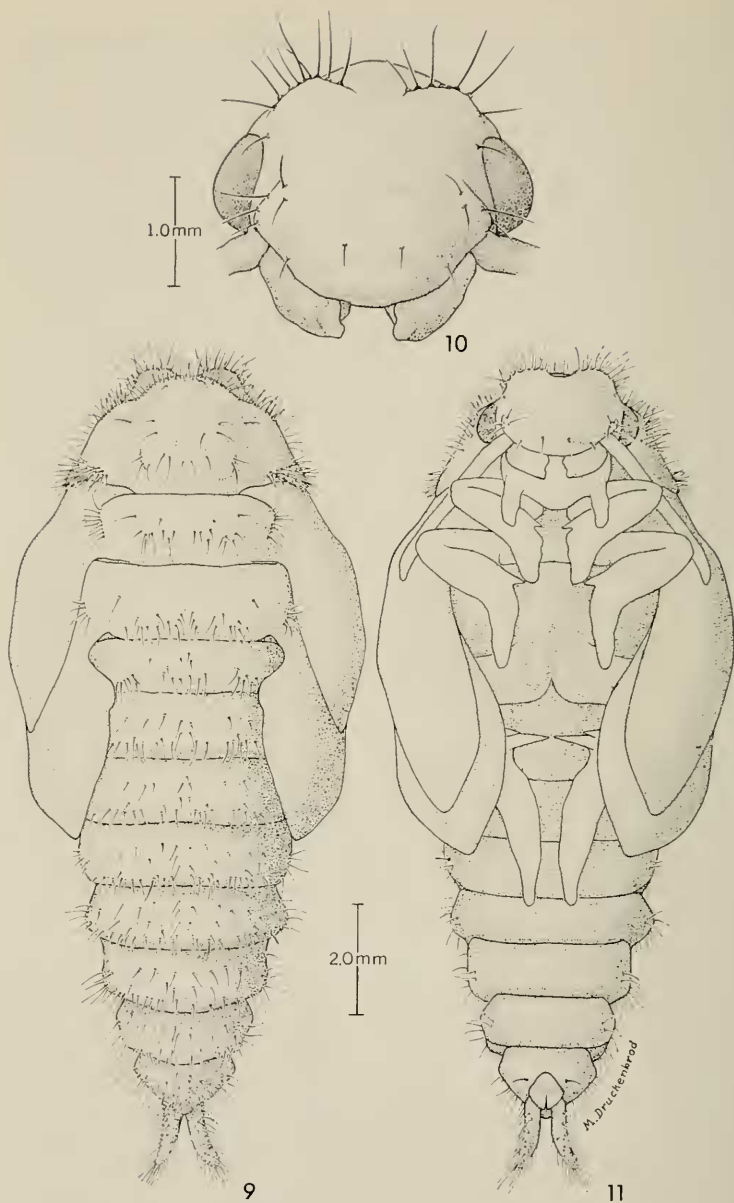
Length (including cerci), 14.0 mm; greatest width, 5.0 mm. Color creamy white except eyes grayish black. With setae as described.

Head (Fig. 10) with 33 setae as follows: 8 or 9 on each ridge dorso-medially of each eye; 1 at upper corner of each eye; 5 at anteroventral angle of each eye; and 4 across labroclypeal impression.

Pronotum with approximately 170 setae arranged along anterior, lateral, and posterolateral margins and on the disc as illustrated. There are 19 setae on each side of the midline of the mesonotum and 17 setae on each side of the midline of the metanotum.

On several of the abdominal segments, the setae are unequal in number on opposite halves of the pupa; therefore, a numerical formula is used that gives the number of setae on the left and right side of the midline. The midline is indicated by a -M- between the number of setae. The setae are arranged as follows: abdominal segment 1, 16-M-14; abdominal segment 2, 24-M-24; abdominal segment 3, 23-M-28; abdominal segment 4, 28-M-25; abdominal segment 5, 28-M-26; abdominal

* The shortcomings of couplet 8B are obvious but it is provided to assist in recognizing *Rhantus* larvae at least from southern localities as well as the large last-instar *Colymbetes* larvae.



FIGS. 9-11. *Hoperius planatus* Fall, pupa: 9, habitus, dorsal view; 10, head, frontal view; 11, habitus, ventral view.



FIG. 12. *Hopperius planatus* Fall, known distribution.

segment 6, 29-M-23; abdominal segment 7, 24-M-19; abdominal segment 8, 24-M-21. Some abdominal setae are hidden under the wing pads and along the sides of the pupa and, therefore, do not show on the habitus view (Fig. 9).

Abdominal segment 9, mostly hidden by expanded 8th segment, terminates in 2 stout cerci about equal in length to the 8th segment; each cercus bearing 35-45 setae, most of these setae on lateral and apicomedial margins.

First through sixth abdominal segments each with a pair of spiracles, 1 on each anterolateral corner of each segment; no spiracles visible on 7th abdominal segment.

Antennae directed posteriorly and obliquely beneath head, lying between wing pads and femora. Front and middle femora extend outward at right angles from body axis and lie beneath elytral wing pads. First 2 pairs of legs with tibiae folded against femora; tarsi turned backward parallel with body axis. Hind femora and tibiae hidden between abdomen and pads of hind wings. Each hind leg with femur and tibia not folded against each other; femur directed obliquely away from midline; tibia directed obliquely toward midline; tarsus almost parallel with body axis.

DISTRIBUTION

I have examined the following adult and larval specimens of *Hopperius planatus*: ARKANSAS: Hempstead County: Hope (at light), 11 June 1926, L. Knobel, ♂ holotype (MCZ). Lawrence County: Imboden, 9 Feb. 1927, B. C. Marshall, 1 adult (MCZ); Imboden, York Springs, 18 May

1927, B. C. Marshall, 1 adult (MCZ).—MARYLAND: Talbot County: Easton, Seth State Forest, 13 June 1967, J. L. Hellman, 2 adults (USNM); Easton, Seth State Forest, 19 July 1971, P. Spangler, 2 adults (USNM); Easton, Seth State Forest, 6 May 1972, P. and P. Spangler, 1 larva (USNM); Easton, Seth State Forest, 8 May 1973, P. and P. Spangler, 1 adult, 4 larvae (USNM); Easton, Seth State Forest, 19 July 1971, R. D. Gordon, 6 adults (RDG); Easton, Seth State Forest, 26 Sept. 1971, J. Utmar, 1 adult (USNM); Easton, Seth State Forest, 29 July 1973, Spangler and Cross, 8 adults (USNM); Wittman, 26 May 1973, W. Steiner, 1 adult (WS).—SOUTH CAROLINA: Florence County: Florence, 4 May 1953, 28 Nov. 1957, V. M. Kirk, 2 adults (VMK). Horry County: Myrtle Beach (at light on beach), 19 May 1955, V. M. Kirk, 1 adult (VMK).—VIRGINIA: Nansemond County: Dismal Swamp, 11 June, 29 July 1970, J. Matta, 2 adults (USNM).

LITERATURE CITED

- BLACKWELDER, RICHARD E. 1939. Fourth Supplement 1933–1939 (inclusive) to the Leng Catalogue of Coleoptera of America, North of Mexico. 146 pp. Mount Vernon, New York: John D. Sherman.
- CHANDLER, HARRY P. 1956. Key to the Known Nearctic Genera of Dytiscidae, Larvae. In: *Aquatic Insects of California*, pp. 312–314. Berkeley and Los Angeles: University of California Press.
- FALL, HENRY C. 1927. A New Genus and Species of Dytiscidae. *Jour. New York Ent. Soc.* 35:177–178.
- KIRK, VERNON M. 1969. A List of Beetles of South Carolina. Part 1—Northern Coastal Plain. *South Carolina Agr. Expt. Sta. Tech. Bull.* 1033:124 pages.
- LEECH, HUGH B. 1956. Key to the Genera of Dytiscidae of the United States and Canada, Adults. In: *Aquatic Insects of California*, pp. 309–312. Berkeley and Los Angeles: University of California Press.
- SPANGLER, PAUL J. 1972. A New Genus and New Species of Water Beetle from Bolivia with a Key to the Genera of the Western Hemisphere Colymbetini (Coleoptera: Dytiscidae). *Proc. Biol. Soc. Washington* 84(49):427–434.